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ABSTRACT

Many of the students enrolled in Hawai'i Community College's (HCC's) Trade and Industry Division have poor reading skills, with Nelson-Denny comprehension scores averaging a 9th grade equivalent. Despite a lack of motivation and interest in reading, trades students must be able to understand trade-technical handbooks, manuals, references, specification sheets, graphs, and diagrams. Even the best readers may find this material tedious and confusing. To help trades students develop the needed comprehension, problem-solving, and critical reading skills, HCC has developed an occupational reading curriculum that uses specialized instructional methods and materials. Specific reading modules, developed for each program in the division, are composed of introductory, comprehension, and problem-solving/applications sections, providing practice in using pertinent trade manuals, understanding technical materials, and developing general reading and study skills. Trade manuals, such as the Uniform Building Code and National Electric Code, are basic references and often represent the most difficult reading students must do. Some general survey modules based on such manuals are "Survey of Metallurgy--Chapter 1" and "Sheet Metal Pattern Drafting: Using the Appendices." Other modules are based on trade-related materials such as handouts, references, and technical readings, including modules in "Understanding the Relationship of Power, Speed, and Torque for Engines" and "Fatigue Failure in Sheet Metal." Modules based on reading and study skills include "Reading for Main Ideas" and "Technical Vocabulary Development." Word problems that simulate on-the-job situations as well as theoretical applications help develop problem-solving skills. Students find such readings relevant and are more likely to attend to the task at hand. Sample problems are included. (ECC)

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LEARNING FOR LITERACY IN THE VOCATIONAL TRADES

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LEARNING FOR LITERACY IN THE VOCATIONAL TRADES

A vocational-technical occupational reading curriculum that encourages literacy for technology has been the core of a reading program for trades students at Hawai'i Community College in Hilo, Hawai'i. The curriculum, featuring vocational-technical trades content modules, is designed for two-year trades students enrolled in the carpentry, automotive mechanics, auto body repair, electrical technology, welding and sheet metal, diesel mechanics and machine technology programs. The modules address the special needs of trades students in developing literacy for technology and in overcoming problems not resolved through more traditional teaching-learning methods and materials.

Problems

The students are enrolled in the college's Trade & Industry Division as post-secondary open-admission candidates. Most have poor reading skills, averaging a grade equivalent comprehension score of 9.0 or below on the Nelson-Denny Reading Test-Form E and an average of below the fiftieth percentile on the Industrial Reading Test-Form B. The typical student is underprepared to handle the rigors of technical reading, lacks motivation and is a low achiever academically.

Trades students are required to take English 051-Occupational Reading as one of the related liberal arts courses required for graduation. The majority of the students have a negative attitude toward non-trade "academic" type courses and they see little value in, or need for, well-developed reading skills. These students generally perceive Occupational Reading as an unnecessary,

irrelevant course that takes valuable time away from their trade programs. Furthermore, they see no connection between an "English/Reading" class and their goal of getting a job in the respective trade area.

Reading Needs of Trades Students

Vocational-technical trades students simply need to be better readers than they generally are. Their chosen fields demand it. Many are the classic "reluctant" readers and are not academically prone. They need to practice reading more in order to improve their skills to deal with the volume and complexity of the technical reading in their chosen trade area.

Trades students must comprehend expository material laden with technical vocabulary; be able to problem solve using complex trade-technical handbooks, manuals and references; comprehend specification sheets, data sheets, etc; locate and extract information from graphs, tables, charts, diagrams, etc.; translate information into solutions/answers to problems on the job/in the shop; be able to follow sequential directions or steps in a given operation or procedure; know and understand the regulations governing their respective trade and occupational field. In short, they must be able to read and understand complex material to complete their training program and to be successful on the job.

Granted, some of these students can locate main ideas reasonably well, but many cannot draw conclusions or make inferences readily. Many are easily confused in reading and sorting out main ideas and details and are easily lost in the

technical vocabulary of their trade field. Occupational reading course materials should then provide general reading experience and practice and specific skill development.

In comparison to liberal arts or general studies students, trades students need to be more technologically literate. Trades students traditionally are not as academically mature or prepared as are liberal arts or general studies students. They have difficulty in handling the demands of technical reading in their respective trade area.

Technical material is often concisely and precisely worded using technical vocabulary to state difficult ideas and concepts. This is material that even the best of readers find tedious, confusing, time-consuming and frustrating.

Trades students need to be proficient at problem solving on the job. It is expected of them. They cannot afford to guess at answers or solutions. In the trades, there is little margin for error. They must be able to analyze a situation, troubleshoot and diagnose carefully, recognize what information is needed, know where to find it quickly, and apply that information in a prescribed and accepted manner.

The skill of problem solving on the job requires that students be familiar with and know how to use the standard working references in their trade fields. Thus, a major goal of the Occupational Reading course is to make reading material that is technical and difficult for the best of readers, manageable and meaningful for reluctant readers.

Modules

A series of modules in all trades areas was developed to help students learn how to manage reading technical materials as well as improve their general reading skills. These modules include activities in general comprehension, main idea and details, inferences, problem solving, critical reading, etc.

Most modules are based on existing trade related materials used in the respective trade programs. The various modules developed are composed of introductory-survey, comprehension, and problem solving/application sections. The modules provide hands-on practice in using various sections of the respective trade text or manual, related technical readings and materials, and general reading and study skills instructional materials.

When practical, the trade manual or textbook is the subject of the initial module which introduces the student to his/her trade text as a source of information. For most trades students, the textbook or manual is the basic reference they must master and represents some of the most difficult reading they will do. Some of the trade manuals used are the Uniform Building Code (carpentry), National Electric Code (electricity), Machinery's Handbook (machine technology), and Sheet Metal Pattern Drafting (welding and sheet metal).

Some general survey module topics developed for this curriculum based on trade texts or manuals currently in use are "Survey of Metallurgy-Chapter 1," "Machinist's Module," and "Sheet Metal Pattern Drafting-Using the Appendices."

Other modules are based on trade-related materials such as handouts, references, technical readings and other resources. Some of these topics are "Understanding the Relationship of Power, Speed and Torque for Engines," "Fatigue Failure in Sheet Metal," "Solar Hot Water Heaters," "Building Permit Application," and "Contractor's License Application."

Modules based on general reading and study skill instructional materials cover such topics as "Reading for Main Ideas," "SQ3R and Technical Reading," "Technical Vocabulary Development," "Technical Library Resources," "Textbook Underlining and Marking," and etc.

Modules have a cover page which outlines the terminal objective, instructions and materials needed. The module's multiple activity sheets are similarly labeled. It is essential that students know exactly what is expected and what they will be doing. With the inclusion of reading objectives with each activity sheet, students begin to make connections between learning to read better and learning more about their trade.

Module Activity Sheets

In the initial module for each class, students complete a thorough introduction-survey of their trade text or manual. Students survey the book while responding to questions regarding the table of contents, chapter-unit headings, organization, layout, index contents, appendices, glossary, etc. This helps students become familiar with the general content and organization of the text or manual.

Additional activities covering an introduction to technical

vocabulary are also included. These activities help students begin building competency and familiarization with related trade terminology. For machinists or welders these activities might cover such words as "tensile strength," "lap seam," "annealed," and "viscosity." For auto or diesel mechanics, such words as "thrust bearing," "compression ratio," "turbocharger," and "intake valve" are common. Other trades use similar related terminology. Students can write a definition or draw a sketch of the term to demonstrate usage and understanding.

Module comprehension activities are designed to improve students ability to understand technical material. The emphasis is on using the trade text or manual to read sections and answer general comprehension questions by locating specific information.

The process involves identifying a key word in the question, looking for a citation in the index, finding the appropriate page and section, and then locating the answer to the question. The student must use the skills of locating and identifying information and reading for main ideas and details to locate the answer.

The following example is taken from an auto mechanics module on "Engine/Motor Torque,": In the section Engine Power as Related to Speed, explain why on the graph, power does not start at zero. The student reviews the section in the module and studies the graph. The module section states and the graph demonstrates that engines will not run all the way to zero speed, so the curve is cut off at the bottom. This process allows students to learn to use trade texts, manuals and related materials to locate information

and to understand technical information better.

Problem solving activities are organized around word problems that simulate on-the-job situations as well as theoretical applications. The student goes through a four step problem solving process. First, the student identifies the problem and what information is needed; second, the student locates the information necessary to solve the problem; third, the student reads the information and applies it to the problem; fourth, given the problem, the student determines the appropriate solution.

As an example, an electricity technology module based on the National Electrical Code 1992 (handbook for electricity students) includes the following problem: Article 210-52 of the NEC handbook covers installation of Dwelling Unit Receptacle Outlets. You are installing the wiring for a dwelling The family room has walls 18 x 12 x 18 x 4 feet with eight foot sliding doors next to the four foot section. How many receptacles should be installed? What is the purpose of the code regulation in this section?

To solve the problem, the student needs to be familiar with the specific code article/section concerned. The student consults the NEC 1992 handbook and proceeds with the four-step process noted above in finding the appropriate information on the number of receptacles to install.

According to the code (Article 210-52 (a) page 70-39/40), "...receptacle outlets shall be installed so that no point along the floor line in any wall space is more than 6 feet (1.83 m), measured horizontally, from an outlet in that space, including any

wall space 2 feet (610 mm) or more in width and the wall space occupied by sliding panels in exterior walls."

After drawing a rough diagram and making calculations based on code information given, the student should arrive at the correct solution: five receptacles should be installed. Furthermore, the article states that the purpose of this requirement is to minimize the use of cords across doorways, fireplaces and similar openings.

The length, use and content of modules varies by trade class and group composition. Most modules are short term projects ranging from an hour to several hours of work time. Module activities are either instructor or student corrected depending on the individual class situation. Modules can be used in both small and large group instruction, individualized instruction, in a regular classroom or in a learning center.

Summary

Technical reading modules utilizing introductory-survey, comprehension, and problem-solving/application activities are a useful method of providing trades students practice in general reading exercises as well as teaching them how to read and use technical materials. Since most modules are based on specific trade related material, reading becomes relevant to the students. They are more likely to attend to the task at hand, reading technical material, and develop positive attitudes in the process. Learning for literacy in the vocational-technical trades where there was little previously is the program's desired outcome.

Table I

This table provides pre- and post-test data for the past four years using results from the Industrial Reading Test-Form B (1977) as the entry-exit assessment instrument. The Industrial Reading Test is the most compatible instrument found as it reflects general reading and technology-oriented content similar to the course content utilized in the modularized program. The tabulated results by group/semester and percentile averages are as follows:

Fall, 1988

Carpentry: n = 11		Auto Mechanics: n = 11	
Pre-test:	25 percentile	Pre-test:	25 percentile
Post-test:	40 percentile	Post-test:	25 percentile

Fall, 1989

Carpentry: n = 9		Auto Mechanics: n = 12	
Pre-test:	50 percentile	Pre-test:	25 percentile
Post-test:	50 percentile	Post-test:	25 percentile

Spring, 1991

Electricity Technology: n = 12

Pre-test:	55 percentile
Post-test:	60 percentile

Fall, 1991

Diesel Mechanics: n = 8		Auto Mechanics: n = 8	
Pre-test:	15 percentile	Pre-test:	40 percentile
Post-test:	25 percentile	Post-test:	50 percentile

Spring, 1992

Electricity Technology: n = 18		Machine Technology: n = 5	
Pre-test:	50 percentile	Pre-test:	50 percentile
Post-test:	55 percentile	Post-test:	60 percentile

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